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ABSTRACT

This study examined the relationship between student achievement on the Texas Assessment of Basic Skills (TABS) test and the total student population in 206 school districts in North Texas. Regression analyses results indicated that average student performance on the TABS was positively affected by local expenditures, negatively affected as the percentage of Hispanic students increased, and not affected by the enrollment in the various school districts. (JAM)

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STUDENT ACHIEVEMENT AND SIZE OF SCHOOL DISTRICT IN NORTH TEXAS

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ABSTRACT

Student Achievement and Size of School District in North Texas

This research examines the relationship between student achievement on the Texas Assessment of Basic Skills test and the number of pupils in the school district. Regression analyses results indicate that average student performance on the TABS is positively affected by local expenditures, negatively affected as the percentage of Hispanic students increases and not affected by the enrollment in the school district.

INTRODUCTION

The American public education system has received considerable attention in the last five years, however, most of that attention has been focused at the national and state levels. Very little attention has been focused on the local school districts. Since education is delivered, not by states, but by local school districts, these state-by-state comparisons have offered little in the form of useful policy. This research is an attempt to rectify part of this problem by analyzing two hundred and six local school districts located in North Texas. The schools are located in Texas Education Agency egions, nine, fourteen, sixteen and seventeen serving the areas around Wichita Falls, Abilene, Amarillo and Lubbock, respectively. The area is relatively homogenous and except for the four large city school districts all of the school districts are relatively small.

Hanushek [1986:1162] in his review of the research on the economics of schooling concluded that differences in student performance are not systematically related to variations in school expenditures. Thus schools are economically inefficient since they theoretically could produce the same product (student performance) at a lower cost. The policy implications are obvious. School districts

should stop paying for things that don't matter such as smaller classes, graduate degrees and years of experience and start searching for and rewarding the things that do matter. This research is an attempt to search out some of the things that do matter.

THE LEARNING MODEL

The model for this research is the classical economic production function where output, in this case student achievement on the ninth grade TABS (Texas Assessment of Basic Skills) test is considered to be a function of a set of independent inputs. The TABS test results, in average percentage form for 1985, by school district, for mathematics, reading, writing and then an average of the z scores for all three were used as the dependent variables in a single equation regression model. The first independent variable was; locally generated expenditures per pupil which was calculated from the tax rate and valuation data from 1983/84. It was assumed that the states contribution which is based on average daily attendance was the same on a per pupil basis for each school district. Federal expenditures were ignored. Two variables were used to measure the size of the school district. The number of pupils and the number of pupils squared, a measure of economies or diseconomies of scale, were both used.

The physical size of the school district was entered in square miles since larger districts might have higher

transportation costs, however the simple correlation between square miles and expenditures per pupil was only +.156. Larger districts might also have more geographic area from which to generate oil related valuations. The simple correlation between value and square miles was +.171. Thus neither of these hypotheses are strongly supported by the correlation coefficients, but there could still exist offsetting effects. The last set of independent variables were the percentages of Black, Hispanic, Asian, and American Indian students in each school district. All of the data, except the TABS scores, were for the 1983/84 school year.

In mathematical terms, the model was:

$$Y_i = f(X_1, X_2, X_3, X_4, X_{5j})$$

where Y = Average TABS score for the district in percentage (Mathematics, Reading, Writing, Average z score)

X_1 = Local expenditures per pupil

X_2 = Number of pupils in the district

X_3 = Number of pupils squared

X_4 = Geographic size of the district in square miles

X_{5j} = Percentage of minority students in the district (Black, Hispanic, Asian, American Indian)

THE RESULTS

The student performance models, while significant, all have very low adjusted R^2 s, indicating

that some important variables are not included in the specification. Mathematics scores were positively influenced by local expenditures and negatively influenced by the percentage of Hispanic students. Reading scores were negatively influenced by the percentage of Hispanic students and not significantly influenced by local expenditures. Writing scores were positively influenced by local expenditures and negatively influenced by the percentages of Black, Hispanic and American Indian students. The average z score for all three tests was positively influenced by local expenditures and negatively influenced by the percentage of Hispanic students.

In summary it appears that TABS scores are positively influenced by local expenditures per pupil and lowered when the percentage of Hispanic students in the school district increases. Since it is impossible, in this data set, to segregate migrant Hispanics from native Texans, more research on the educational problems in the Hispanic community is needed. The regression results are included in appendix A.

OPTIMAL SIZE

While the size of the school district as measured by number of pupils and number of pupils squared was not a significant predictor of student performance on the TABS, there still may be an optimal size district

from a cost or expenditure per pupil stand point. If size does not influence performance, then the school district should pick the size that minimizes cost.

The model utilized for estimating expenditures per pupil is as follows:

$$Z = g(X_1, X_2, X_3, X_4, X_{5j})$$

where Z = Local expenditures/pupil

X_1 = Average TABS score (z score)

X_2 = Number of pupils

X_3 = Number of pupils squared

X_4 = Geographic size of district in square miles

X_{5j} = Percentage of minority students (Black, Hispanic, Asian, American Indian)

The regression results were significant ($F = 6.1$, $\bar{R}^2 = .17$), but only X_1, X_2, X_3 and X_4 were significant explanatory variables. The model was estimated again using only these variables, with the following results:

$$Z = 2189.3 + 446.4X_1 - .53X_2 + .00002X_3 + 1.3X_4$$

(206.9)* (153)* (.12)* (.00001)* (.5)*

standard errors are in parenthesis
* significant at p = .05
F = 10.2 $\bar{R}^2 = .15$

Minimizing the above equation indicates that the optimum school district size is 14,654 pupils. This is feasible since the districts in the sample have a range from 59 to 29,409 pupils, but it should be viewed with a great deal of caution since only four districts have more than 10,000 students.

The equation was estimated again using only 202 districts, leaving out the four large city districts. The results indicated an optimum size of about 3030 pupils. The range for this sample was from 59 to 5818 pupils, thus this number may appear to be reasonable, but only twelve districts in the sample exceed 3000 students. In either case, there are many districts in North Texas that could reduce their expenditures per pupil by merging and thus increasing the number of pupils in the district.

EVALUATION OF SCHOOL DISTRICTS

Evaluation scores for the school districts in the North Texas sample were calculated by substituting the values for each school district in the average z score (Y_i) equation. The expected score for the district was then subtracted from the actual score to obtain an evaluation score. A positive evaluation score indicates that the district performed better than expected and a negative score indicates that the district performed worse than expected. Ninty five school districts had negative scores and one hundred eleven had positive scores. Seven districts were more than two standard deviations below the mean and three were more than two standard deviations above the mean. The range of scores was from a positive 1.68 to a negative 3.06 with a mean of zero and a standard deviation of .711.

Obviously some school districts are doing better and some much worse than expected, given their respective characteristics. Additional research on the low and high scoring districts would probably be fruitful, but is beyond the scope of this research.

SUMMARY AND CONCLUSIONS

Average student performance on the TABS test by school district is positively affected by local expenditures per pupil and negatively influenced as the percentage of Hispanic students in the district increases. This study was not designed to explain why the Hispanic community scores lower on the TABS test. The optimum size of school district in order to minimize expenditures per pupil without sacrificing the districts average score on the TABS is at least 3000 pupils, much larger than many existing districts. The evaluation results demonstrate than some school districts perform much better than expected and some perform much worse than expected, given their repective characteristics. The policy recommendations are straight forward, more attention must be paid to educating the Hispanic population and this probably means higher expenditures per pupil. A detailed study of the top and bottom performing school districts might be fruitful. One way to hold down the cost of improving public education in Texas might be to merge many of the smaller school districts.

APPENDIX A
Student Performance

Independent Variables	Dependent Variables Math	Read	Write	Average
Local expenditures/pupil	.001*	.001	.001*	.00007*
	(.000)	(.001)	(.000)	(.00003)
Number of pupils	.000	-.001	-.001	-.00001
	(.001)	(.001)	(.001)	(.00001)
No. of Pupils Squared	.00	.00	.00	.00000
	(.00)	(.00)	(.00)	(.00000)
Square miles	01	.00	.00	.00025
	(01)	(.00)	(.00)	(.00022)
Percentage of Blacks	-13.2	-2.01	-46.2**	-1.48
	(14.30)	(16.0)	(24.0)	(1.11)
Percentage of Hispanics	-11.2*	-21.2*	-11.1**	-1.23*
	(3.5)	(3.9)	(5.9)	(0.27)
Percentage of Am. Ind.	100.3	-281.9	-614.5**	-17.44
	(207.6)	(232.3)	(348.0)	(16.18)
Percentage of Asian	123.4	134.3	-70.8	6.70
	(118.9)	(113.1)	(199.4)	(9.27)
Constant	88.2*	88.4*	73.3*	.18
	(1.8)	(2.0)	(3.0)	(.14)
$\bar{R}^2$	.10	.15	.08	.17
F	3.92	5.54	3.44	6.21

standard errors are in parenthesis
* significant at p = .05
** significant at p = .10

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